

vegetation and succulence through materials (proteins, etc.) built from it or through its lyotropic effects, and whether the partially contrasting effects of phosphates depend upon the first or second condition. Periodicity in salt absorption which has been observed in trees and grains is also minimized. It seems evident that to get far back of the general proposition which KLEBS has apparently proved, there is need of a careful study of internal conditions of the plant, anatomical, chemical, and microchemical, as well as the application (by injection or otherwise) of various salts and carbohydrates and products manufactured from them to be sure of the effective agents.—WILLIAM CROCKER.

**Morphology of *Gnetum*.**—THOMPSON<sup>13</sup> has done a much needed service in making a thoroughgoing investigation of *Gnetum*. We have had too meager information in reference to this important and puzzling genus, owing mainly to the difficulty of obtaining material representing any extended and close series of stages. THOMPSON obtained his material during a visit to the Malay Archipelago, and chiefly from the Botanic Garden at Buitenzorg and the adjacent country. As a consequence, he has published an extended account of all the structures related to reproduction. Several species were investigated, and especially two species that represent the extremes of variation. The details are so numerous that they cannot be repeated in a review, but some of the more important facts may be mentioned. Certain strobili were found in which the flowers are arranged in a spiral, and are thus very suggestive of catkins of Amentiferae. In the development of the megasporangium the 3 envelopes arise in acropetal succession, and the micropylar tube, which THOMPSON regards as a style, develops conducting tissue. No vegetative cells appear in the development of the male gametophyte, and the microspores frequently germinate in the micropylar tube at a distance from the nucellus. At fertilization stage the female gametophyte consists of approximately 256 or 512 free nuclei; and after the entrance of the pollen tube rapid divisions occur, multinucleate compartments being formed and all the nuclei in each compartment fusing.

THOMPSON concludes that the strobili of *Gnetum* are closely related to the catkins of the Amentiferae; that the flowers are reduced from a bisporangiate condition; that the inner "envelope" of the ovulate flower is an ovary homologous with that of the angiosperms and bearing a true style (the micropylar tube); that the female gametophyte is gymnospermous in its early stages and angiospermous in the later ones; that the fusion of nuclei preceding endosperm formation is a forerunner of that in angiosperms; that the angiosperms have been derived from ancestors very much like modern Gnetales, and that, in fact, the genus *Gnetum* should probably be classified with angiosperms.—J. M. C.

<sup>13</sup> THOMPSON, WALTER P., The morphology and affinities of *Gnetum*. Amer. Jour. Bot. 3:135-184. pls. 2-7. 1916.